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REVISED SYSTEM OF NATIONAL ACCOUNTS

CHAPTER XXI

SATELLITE ANALYSIS AND ACCOUNTS

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List of Acronyms

CFC	consumption of fixed capital
EDP	environmentally adjusted net domestic product
GDP	gross domestic product
ISIC	International Standard Industrial Classification
NDP	net domestic product
NPI	non-profit institution
R & D	research and development
SEEA	System of Environmental Economic Accounts

XXI. SATELLITE ANALYSIS AND ACCOUNTS

A. Introduction

1. The central framework of the SNA presents a number of characteristics which give it the advantages of an integrated accounting structure. It is exhaustive and consistent within the boundary of the economic activities it covers; that is to say, each unit, transaction, product and purpose is given a place, and only one, in the classifications and accounts of the System. Moreover, the set of concepts adopted by the System is fully coherent.

2. The counterpart of these benefits is that there are certain limitations as to what may be accommodated directly in the central framework. Of course, the central framework may be used in a flexible way, as explained in <chapter XIX, Application of the Integrated Framework to Various Circumstances and Needs>), in order to put more or less emphasis on specific aspects of economic life, like the public sector, the households, or high inflation. However, the margins of flexibility allowed by the central conceptual framework do not permit conflicting approaches to be covered at the same time.

3. As already indicated in several earlier chapters, the SNA does not claim that its categories and concepts are in all cases the only right ones. Additional or different requirements necessitate the development of complementary or alternative categories and concepts.

4. Satellite accounts or systems generally stress the need to expand the analytical capacity of national accounting for selected areas of social concern in a flexible manner, without overburdening or disrupting the central system. It is useful to preview in very summary form the characteristics of satellite accounts or systems, which will be elaborated throughout the chapter. Typically satellite accounts or systems allow for:

(1) the provision of additional information on particular social concerns of a functional or cross-sector nature;

(2) the use of complementary or alternative concepts, including the use of complementary and alternative classifications and accounting frameworks, when needed to introduce additional dimensions to the conceptual framework of national accounts;

(3) extended coverage of costs and benefits of human activities;

(4) further analysis of data by means of relevant indicators and aggregates; and

(5) linkage of physical data sources and analysis to the monetary accounting system.

5. These characteristics, even in the summary form, point to important roles for satellite analysis and accounts. On the one hand, satellite accounts are linked with the central framework of national accounts (as will

be spelled out at several points in the chapter) and through them to the main body of integrated economic statistics. On the other, as they are more specific to a given field or topic, they are also linked to the information system specific to this field or topic. They also call for better integration of monetary and physical data. Because they do not lose close connections with the central accounts, they facilitate analyses of specific fields in the context of macro-economic accounts and analyses. Satellite accounts in various fields may, in addition, help to connect analyses between some of those fields. Satellite accounts are thus able to play a double role in general, as tools for analyses and for statistical coordination.

6. The objectives of the present chapter are threefold. Firstly, it indicates, in section B, what kind of variants are or could be thought of in general when allowing for additional degrees of freedom. The approaches referred to may lead to various types of solutions, from just introducing some additional figures to redesigning the main concepts of the central framework. Secondly, in section C, the chapter presents a framework for functionally oriented satellite accounts, the ambition of which is somewhere in between the two extreme types of solutions mentioned above. Thirdly, in section D, the chapter presents environmental accounting in a SNA satellite accounting framework. Environmental accounting, which is of such importance as to deserve special consideration, is explained by reference to a generalized and extended version of the System of Environmental Economic Accounts.

B. Satellite Analysis

7. In this section, a step-by-step approach is followed in order to illustrate by example various means of broadening the analyses. Production and products, primary incomes and transfers, uses of goods and services, assets and liabilities, purposes as well as aggregates are considered in turn.

1. Production and products

8. Within the production boundary of the central framework of the SNA, producing units are establishments classified according to their principal economic activity or, in a more refined analysis, homogeneous units of production. Both kinds of units are classified according to International Standard Industrial Classification (ISIC).

9. When establishments, and consequently industries, are not homogeneous at a given level of the ISIC, they undertake both a principal activity and one or more secondary activities. The output of these secondary activities is identified according to its nature, following a product classification, but the inputs of secondary activities are not separated from the ones of the principal activities. Ancillary activities, on the other hand, are not analysed and classified according to their own nature, but as part of the activities of the establishment(s) they serve. This means that ancillary

activities are not undertaken by distinct producing units and the related products do not appear as autonomous products.

10. When examining certain kinds of activity and products, it may be useful to separate secondary from principal activity, in order to get a full picture of the inputs (intermediate and factor inputs) corresponding to the activity being examined. This aspect is well known in input-output analysis. In addition, it may be necessary to identify inside the producing units some ancillary activities and their output.

11. Take the example of transportation. The output of transportation activities in the central framework covers only transport services rendered to third parties. Own-account transportation is treated as an ancillary activity; its inputs are unidentified components of the costs of the producing units it serves. If one wants a broader picture of transportation activity, at least own-account transportation of producing units has to be identified and measured. Looking at health activities, some of them also are treated as ancillary activities, like the on-site medical facilities provided by employers to their employees. Thus the cost of many activities includes an unidentified health component.

12. More generally, inputs of producing units cover the direct cost of making the principal and secondary output and the cost of various internal functions which are, to varying degrees, indirect components of the total cost. In addition to the above-mentioned activities, we could mention training, electronic data processing, accountancy and trade.

13. So, for complete coverage of certain activities and products within the production boundary of the central framework, we have to deal with a number of pieces:

(1) the establishments, or the homogeneous units of production, whose principal or single activity is the one we are interested in (the choice between these two types of units depending on the objectives pursued and the structure of the economy);

(2) if we are dealing with establishments, the relevant secondary output of other establishments, and the intra-establishment deliveries;

(3) the relevant ancillary activities and their output, presumably measured by their costs in general.

14. In many cases, this process is straightforward, because the specified activities and products appear as such in the classifications of the central framework, although, of course, additional data are necessary as regards (3). The relative magnitude of (3) may naturally differ from one activity to another, being more crucial for transportation or data processing than for education for instance.

15. However, in some important cases, like tourism and environmental protection activities, the process of identification is complex, because the relevant activities and products appear only to a small extent in the central framework classifications.

16. An output is usually identified according to a list of observable products, independent of the use that is made of them. This is possible for part of tourism: the services rendered by travel agencies or hotels are typically tourism products. More generally, however, tourism activities are defined by the fact that the goods and services they produce are delivered to tourists - that is, people who spend at least one night away from home, whatever the purpose of their travel. So, long distance transportation is clearly a tourist activity; short distance transportation may or may not be, depending on who is using it. The same is true for shops in tourist areas. Some activities, though clearly tourist in nature, are isolated only at very detailed levels of classifications, for which national accounts are not commonly available, or not identified at all. Consequently, delineating tourism activities raises a lot of difficulties. The approach is in most cases an indirect one, starting from analysing the structure of tourist expenditure by product and looking at what activities are delivering these goods and services.

17. The case of environmental protection activities and products is even more complex. Some establishments specialize in the production of environmental protection services for delivery to other units (e.g., waste disposal, sewage treatment) or goods which are used for environmental protection (e.g., filters). Others direct only part of their activity to delivering such goods and services to third parties. Moreover, an important part of environmental protection activities is internal to establishments. They are ancillary activities in the central framework and have to be externalised if one wants to measure the environmental activities more broadly. Again the purpose of the expenditure has to be considered in conjunction with the kind of activities undertaken and the goods and services used.

18. The above-mentioned re-analysis takes place within the limits of the central framework's boundary of production. For certain objectives, however, the production boundary itself may be changed. This can be done in a rather global way, for example, by including services rendered by persons to other members of their household or/and voluntary work. It may also be done when trying to get a very broad picture of a given activity. For instance, to make an overall estimate of the transportation function in an economy, it might be useful to cover transport services rendered by households using their own cars and to try to value the time people spend using transport facilities. Generally speaking, the scope of non-market activities may be extended considerably.

2. Income

a. Primary incomes

19. When the production boundary is extended, as suggested above, the magnitude of primary incomes is increased, income being imputed for the additional activities which are inserted within the boundary of production.

20. Additional analyses are also possible. For example, one may try to separate the mixed income or entrepreneurial income of the household sector into an element of return to labour and an element of return to capital.

21. In conditions of inflation, it may be judged that nominal interest is not a convenient measure of the return to lent funds. Nominal interest includes an implicit or explicit (in case of indexation) component as compensation for the change inflation occasions in the real value of monetary assets and liabilities. This component may be analysed as a holding gain for the borrower and a holding loss for the lender, rather than as an element of property income (see <chapter XIX, Application of the Integrated Framework to Various Circumstances and Needs> for a possible parallel treatment of interest suitable for countries experiencing significant inflation).

b. Transfers and disposable income

22. Several kinds of transfers in addition to those in the central framework may be delineated, if meaningful.

23. Firstly, transfers may appear in relation with ancillary activities when these activities are externalised, especially when their output is allocated to final consumers. Transfers internal to units may also cover the counterpart of the cost of production of non-market services produced by government when useful to distinguish the producing and the financing functions of government.

24. Secondly, implicit transfers may be made explicit. Implicit transfers refer to influences between units which change the situation on both sides without any flow being treated as an imputed transfer in the central framework. For instance, tax benefits refer to the advantages or disadvantages economic units incur as a consequence of tax legislation by reference to a kind of average situation. Another, simpler example is the case of non-market services provided free of charge by government units to market producers. In the central framework, these services are in collective consumption of government. If a further analysis treats them as an addition to intermediate consumption of market producers, a counterpart should be introduced, preferably in subsidies on production. This approach may be undertaken systematically to measure all types of transfers between government and particular sectors, like agriculture. The implicit benefits resulting from tax concessions, equity participation, soft loans, differential exchange

rates, differential domestic prices, etc., may then be added to subsidies, other current transfers, or capital transfers embodied in the central framework data.

25. Externalities may give rise to a wide range of implicit transfers, when trying to depict and value advantages/disadvantages that are not accounted for in the value of monetary transactions between economic units or that result from actions of these units in absence of any monetary transaction. The environment, of course, gives rise to many external effects (see section D). For example, pollution and nuisances created by producers may have negative effects on final consumers. These negative effects might be estimated, not very easily of course, and recorded as negative transfers from producers to households. In order to balance these negative transfers, one possibility might be to introduce a concept of production of externalities which would result in an output of negative (eventually positive) services and the corresponding final consumption.

26. Thirdly, flows in the Other Changes in Volume of Assets Account and the Revaluation Account of the central framework are candidates for enlarged concepts of transfers and disposable income. One could treat all of them as enlarged current transfers. The balancing item of the Other Changes in Volume of Assets Account, that is, "changes in net worth due to other changes in volume of assets", and the balancing item "changes in net worth due to real holding gains/losses" in the Revaluation Account, would then appear as extraordinary (disposable) income, subsequently as extraordinary saving. In this hypothesis the resulting enlarged disposable income would approximate more closely the ex-post Hicksean income concept. Enlarged saving in effect would then become equal to changes in real net worth less net capital transfers received.

27. However, one may think of making only limited steps in this direction. For instance, a country engaged in a war might find it useful to estimate an additional concept of disposable income by taking into account the destruction due to war. In countries where holding gains or losses on financial assets/liabilities are significant, real holding gains and losses on financial assets and liabilities could be added to disposable income in order to derive a broader measure of income.

28. Naturally, changes in primary incomes of the type described above will also result in adjusted figures for disposable income. One possibility in that context is to adjust the latter only for the component of nominal interest which compensates for inflation, or for the difference between nominal and real interest.

3. Uses of goods and services

29. The coverage of uses of goods and services, either for intermediate or final consumption or capital formation, obviously changes as a result of enlarging the concept of production. For example, if services rendered to each other by members of the same household are included in production, they are finally consumed.

30. The borderline between intermediate, final consumption and capital formation may also be modified in various ways. Two typical cases refer to human capital and consumer durables. When final consumption in education and health is, at least partly, treated as fixed capital formation, the corresponding central framework transactions pass from consumption (mainly final, partly intermediate) to fixed capital formation which results in human capital assets. A less radical treatment is to capitalise only actual expenditures on education (possibly part of expenditures on health) as intangible assets, so extending the scope of the latter. As an immediate consequence, the concept of consumption of fixed capital would be extended.

31. An alternative to the inclusion of expenditures on consumer durables like cars and furniture in household final consumption is to treat them as fixed capital formation. Only that part of the resulting fixed asset that is estimated as consumption of fixed capital enters final consumption. Strictly speaking, this procedure implies enlarging the concept of production to include household services.

32. As a consequence of changes just considered, the concept of saving is extended.

4. Assets and liabilities

33. The scope of assets, either tangible or intangible ones, is modified as a consequence of extending the concept of production or modifying the borderline between consumption and capital formation, as indicated in the previous paragraphs.

34. The scope of financial assets and liabilities also may be broadened by including contingent assets and liabilities in the classification of financial instruments. This modification in fact would be simply a formal one as presumably, following the current corporate practice, equivalent amounts would be included both in the assets and liabilities of each sector involved, unless the present value of the net risk taken is estimated and recorded under, for example, other changes in volume of assets.

35. The scope of non-produced assets recorded in the balance sheets might be extended to other naturally occurring assets. In the central framework, natural assets are included in balance sheets only to the extent that they are owned and capable of bringing economic benefits to their owners. Of course, these criteria would apply to some additional natural assets if the services

they provided were to be included in an enlarged concept of production. Moreover, attempts might be made to cover natural assets more widely to account for the natural patrimony in general. In most cases, however, measurement is then usually only feasible in non-monetary terms.

5. Purposes

36. In the central framework, an analysis by purpose is applied to most transactions of general government and non-profit institutions (NPIs) serving households, to final consumption and some other transactions of households and to certain transactions of producers. (The classifications are described in <chapter XVIII, Functional Classifications>.) This approach may be extended in order to cover a broader range of transactions and transactors. Moreover, the functional approach may be more flexible than it is in the central framework.

37. In the classifications by purpose used in the central framework, headings at a given level are mutually exclusive. A transaction classified under education may not also be classified under health, for example. In some cases, the part of expenditure missing when focusing on a given purpose may be significant and therefore a problem. In particular cases, purposes of current interest hardly feature in the existing general classifications because, for historical or other reasons, priority is given to the analysis of other purposes. For example, besides the fact that tourism does not appear as such as a main category in the classification of household goods and services by object, it is not even possible to reassemble the necessary pieces because not all of them are shown in the classification. The case of environment is similar with respect to various classifications.

38. Consequently, when emphasis is given to a particular purpose, a reclassification of a number of transactions is often necessary. All programmes or transactions related to environmental protection, for example, may thus be identified and grouped into a specific purpose classification. Such specific classifications have to be designed to cover the various units concerned - market producers, government and NPIs, households as consumers - in a consistent way. Of course, once reorganized that way, transactions classified by purpose are no longer additive since some of them may appear simultaneously under education and health, defence and health, environment and agricultural or energy affairs, transport and tourism, etc.

6. Aggregates

a. Changes in the main aggregates shown in the central framework

39. A number of the complementary or alternative analyses mentioned above may modify the main aggregates as shown in the central framework either directly or indirectly. Examples of direct modifications are the increase in

output, value added and final consumption when household internal services are included within the boundary of production, or the increase in fixed capital formation if human capital is considered an economic asset. Other aggregates are indirectly modified: saving in the latter case, disposable income in the former one.

40. Accounting for the use of natural resources and changes therein, like subsoil mineral deposits, might also lead to the measurement of complementary or alternative aggregates (see section D). In fact, in these and similar cases, a new system of national accounts is explicitly or implicitly rebuilt, as the alternative aggregates might be introduced in a differently conceived central framework.

b. Introduction of aggregates by purpose

41. In other types of analysis, the objective is to focus on one specific field of concern, like education or tourism. Changes in some concepts and aggregates of the central framework may be introduced, but this is not the primary intention, nor is it intended to give a different picture of the overall economic process.

42. In this approach, one may wish to define and measure one or more aggregates to capture at a glance the magnitude of the resources an economy is devoting to the field of concern. In some cases, the functional analysis of the central framework directly provides figures that are very close to the ones sought. For defence, for instance, the sum of collective consumption and capital formation corresponding to that purpose in general government accounts will normally give what we want to know. This means that national expenditure on defence is obtained directly as a part of national expenditure. Here the problem is easy to solve because only one institutional sector is involved and the object concerned appears as a specific heading in the classification of functions of government. 1/

43. In most cases, however, more than one sector is involved and the classifications do not directly contain the items of interest. In addition, the required aggregate is not necessarily composed only of final consumption and capital formation. A broader concept has therefore to be specifically defined, in order to cover all aspects of the national expenditure in the field of concern. This is further elaborated in section C.

1/ Of course, even in this simple case, one might argue that a full picture of defense expenditure would necessitate including other elements like the opportunity cost of conscripts and volunteers, some expenditures related to internal order, research on military objectives carried out under non-defense headings, etc.

7. Other aspects

44. This section illustrated various ways and means of extending national accounts work. The examples given do not attempt to cover systematically all kinds of complementary or alternative solutions. For instance, different methods may be used to value economic flows, as well as assets and liabilities. Some of these methods are included in the central framework; others may be considered more broadly in satellite analyses, like opportunity cost or the net present value. The labour content of flows of goods and services may also be studied. The underlying economic significance of certain arrangements as, for instance, advertising expenditures by businesses that highly support newspapers and TV programmes, might be examined.

8. From analyses to accounts

45. Broadly speaking, two types of satellite analysis may be distinguished in their relation with the central framework of the SNA. One type involves some rearrangement of central classifications and the introduction of complementary elements that differ from the conceptual central framework (like the identification of the output of ancillary activities) without drastically diverging from the concepts on which the central framework is built. These constructs are not based on nor emphasize alternative concepts, even when they use some on a complementary basis. This first type of analysis mostly covers accounts specific to given fields like education, tourism and environmental protection expenditures. Introducing their content into the central framework would overburden it and would not be totally possible; doing it in a specific, satellite, accounting framework allows additional margins of flexibility.

46. The second type of satellite analysis is mainly based on concepts that are alternatives to the ones of the SNA. A different production boundary or enlarged concepts of consumption and capital formation may be introduced, or the scope of assets may be extended, the borderline between economic phenomena as covered by the central framework and natural phenomena may be displaced, the links between income and wealth may be put in the context of a broader concept of wealth, including natural patrimony, etc. A number of alternative concepts are generally used at the same time. This second type of analysis may involve, as does the first one, changes in definitions or classifications, but in the second type the main emphasis is on alternative concepts. Using those alternative concepts may give rise to partial complementary aggregates the purpose of which is to supplement the central system. Various efforts are also made to include some or all of them in an alternative system of national accounts.

47. The second type of research work is evidently more controversial than the first one, but it makes important contributions. It permits national accounts work to be extended beyond what is, or perhaps might be, included in the central system of the SNA. It provides useful results for economic analysis. It experiments with new concepts and methodologies, with of course a much wider margin of freedom than in current national accounts work. This

research work may influence the development of the central national accounts themselves. This manual does not make standardized recommendations as to this type of work, which by definition must remain open. Environmental accounting is considered in this context in section D. That section uses for explanatory purposes a version of an accounting framework called System of Environmental Economic Accounts, which should be considered work-in-progress and just one of the frameworks in which environmental account could be developed.

48. On the other hand, the work already done in functionally oriented satellite accounts - the type of research work referred to in <<paragraph 45>> - refers to a family of satellite accounts for which it is possible to propose an accounting framework which could be used as a reference by people intending to built such accounts.

C. A Framework for Functionally Oriented Satellite Accounts

49. From the previous section, it is clear that satellite analysis may apply to various aspects of national accounts and pursue different objectives. One approach is to concentrate on one field to give a full picture of it, in a systematic way, by establishing a specific accounting framework, articulated with the central framework.

50. As regards its relations with the central framework, such a specific, satellite framework does not aim at covering all economic life; it is a self-consistent framework in a partial domain. Escaping from some constraints of the central framework, which is mainly institutional in nature, a satellite framework or account is by hypothesis more functional.

51. To put more emphasis on the functional point of view, such satellite accounts combine an extension of the kind of activity and product analysis and a generalization of the purpose approach. It is then possible to try to design an accounting framework to cover a wide variety of cases, all of them belonging to a family of functionally oriented satellite accounts. Such accounts are relevant for many fields, like culture, education, health, social protection, tourism, environmental protection, research and development (R & D), aid for development, transportation, data processing, housing and communications.

52. Most of the fields just mentioned refer to services, they generally spread over a number of activities and they correspond in many cases to subjects that very often are of social concern. It should be noted at the outset that because the fields of functionally oriented satellite accounts sometimes overlap, the shares of national expenditure in those fields in relation with gross domestic product (GDP), for example, may not be strictly additive. Some activities/ products/purposes may be classified in several places. Thus, if shares of overlapping fields have to be calculated, the denominator will normally have to be modified.

1. Scope of a functionally oriented satellite account

53. To analyse a specific field in depth and at the same time have the possibility of calculating some significant aggregates such as national expenditure, the starting point is an analysis of the uses. This corresponds to the question "how many resources are devoted to (education, transportation, tourism, environmental protection, data processing, etc.)" or, identically, "how much is spent on (education, transportation, etc.)?". In order to answer this question, we have to decide upon:

(1) the goods and services that we will consider specific to this field, where national expenditure includes the uses (current or capital) of these specific products;

(2) the activities for which we will record capital formation;

(3) the transfers that we will consider specific to this field, recognizing that they will be a separate component of national expenditure only to the extent that they are not already included in the value of the uses of the specific products (otherwise, they will be analysed only in relation to financing).

54. Depending on the field, the design of a given satellite account will emphasize -

(1) the detailed analysis of the production and uses of the specific goods and services (e.g., R & D or transportation);

(2) the detailed analysis of transfers (e.g., social protection);

(3) both production/uses and transfers equally (e.g., education and health);

or

(4) uses as such (e.g., tourism, environmental protection).

55. When units which are the users, as actual consumers or investors, and units which ultimately bear the expenses coincide, figures for users tell us who finally bears the expenditure. This is the normal case for data processing and to a large extent transportation or tourism. On the other hand, ultimate users and ultimate bearers of the expenses may often differ, as is the case for education and health. In these cases, analysing the way the uses are financed is very important. When transfers represent all, or the main part of, national expenditure, this analysis is even more crucial.

56. Analysing in detail who are the users, consumers, investors, or transfer recipients is thus an important part of what can be done in a satellite account. Even if the aggregate under study is called national expenditure,

the users in this context are the units which actually acquire the goods or services (for actual final consumption, intermediate consumption or capital formation) or receive specific transfers which are not intended to finance these acquisitions of goods and services.

57. Finally, as we focus attention on one field, it is useful to associate non-monetary figures to the monetary ones. Non-monetary figures relate to producing units and factors of production (labour, various kinds of assets) and users/beneficiaries.

58. In short, a satellite account in a given field covers the analysis of uses or benefits out of the national expenditure, production and its factors, transfers and other ways of financing the uses, both in value terms and, when relevant, in physical quantities.

2. Uses/national expenditure

59. The field of a given satellite account is essentially delimited by defining the content of the various types of uses to be included in the specific aggregates relevant to this field.

60. Table XXI.1, Components of Uses/National Expenditure, shows the components of national expenditure. It is convenient to define and measure in the first instance the uses of resident units. However, uses of resident units may be financed partly by non-resident units. This part has to be deducted in order to get a total that corresponds to the effort a nation is making in a given field out of its own resources.

3. Components of uses/national expenditure

61. The first step is to define the goods and services that are considered specific to this field. It is convenient to distinguish two types of specific goods and services in this context: characteristic goods and services and connected goods and services. The first category covers the products which are typical for the field under study. We are interested in studying the way these goods and services are produced, what kinds of producers are involved, what kinds of labour and fixed capital they use and the efficiency of the production process and, hence, of the allocation of resources. For example, for health, characteristic products are health services, public administration services, education and R & D services in health.

62. The second category, connected goods and services, includes products in whose uses we are interested because they are clearly covered by the concept of expenditure in a given field, without being typical, either by nature or because they are classified in broader categories of products. In health, for example, transportation of patients may be considered connected services; also pharmaceutical products and other medical goods, like glasses, are very often treated as connected goods and services. For these connected goods and

services, we are not primarily interested, when studying a given field, in their conditions of production. If we were, these products would have to be treated as characteristic goods and services. For example, pharmaceutical products might be considered characteristic in the account for health of a country at a first stage of developing a domestic industry. The precise borderline between characteristic and connected products depends on the economic organization in a given country and the purpose of a satellite account.

63. The economic activities providing the two types of specific products are given a different treatment in a satellite account, as explained below.

64. Specific goods and services generally appear at various levels and/or in various headings of the product classification used in the central framework. The headings in question are regrouped and additional details are introduced in order to build up the classification specific to a given satellite account. However, in order not to conflict with the requirements of statistical coordination, this specific classification remains strictly linked to the central classification of reference.

65. Some services may appear in the specific classifications of two or more satellite accounts. For instance, research in health services in higher education institutions is at the same time a specific product of both R & D and of education and health. (Of course, if aggregation of national expenditure in different fields had to be considered, double counting would have to be avoided.)

66. Items 1 and 2 of the uses/expenditure table XXI.1 relate to uses of the specific goods and services. Item 1 is consumption of specific goods and services. It covers actual final consumption (defined as in the central framework) and intermediate consumption. Market and non-market products are distinguished and, for the latter, individual and collective consumption. The amounts are the same as in the central framework, unless the boundary of production is changed (for example, by including voluntary work in education and health) or a different type of valuation is adopted (see <<paragraph 75>> on consumption subsidies). Intermediate consumption generally has a broader coverage than in the central framework, as the output of the relevant ancillary activities is identified (while intra-establishment deliveries must be recorded). As a consequence, it covers (actual) intermediate consumption as defined in the central framework and internal intermediate consumption. In some cases, like transport services, the last component may be important in size. Sometimes, it could be considered that this internal intermediate consumption is treated as final and added to actual final consumption, as in the use of ancillary education and health services, thus broadening the scope of household actual final consumption.

67. Item 2 is capital formation in specific goods and services. In an account for housing, for example, it covers fixed capital formation in residential buildings. In R & D, education and health, item 2 is empty if the related services are all included under consumption as in the central

framework. Of course, if all or part of these services were treated as capital formation in a satellite account, the corresponding uses would appear under item 2.

68. In addition to fixed capital formation, item 2 may cover changes in inventories. It may be so when specific goods are involved. As far as specific services are concerned, changes in inventories may relate to work in progress, for instance in software or some tourism services like input costs already incurred in the preparation of tours not yet sold.

69. In an account for culture, acquisitions less disposals of valuables, such as paintings, may be significant. It is in this case a component of item 2.

70. The definition of item 3, fixed capital formation of characteristic activities in non-specific products and their acquisitions less disposals of non-produced non-financial assets is a bit more complex.

- It does not cover the total fixed capital formation of these activities because that part consisting of specific products is already included in item 2.

- When characteristic and connected goods and services are distinguished, only the fixed capital formation of activities whose output consists of characteristic goods and services is covered in item 3. (If we were interested in the capital formation of activities whose output is non-characteristic, and it may be so in certain circumstances, the products and activities in question would have to be considered characteristic.)

- If establishments are used, item 3 may be a bit broader in scope than it should normally be because they may cover some secondary activities.

- Item 3 includes acquisitions less disposals of non-produced non-financial assets, mainly land. The acquisition of land may be important in such cases like education, health, tourism and housing.

71. Of course, the fixed capital formation in item 3 may be studied using a classification adapted to each satellite account. For example, if considering education or health, fixed capital formation in schools or hospitals could be further classified by various kinds of educational structures, medical equipment goods, etc.

72. The approach followed thus far when defining the content of items 1 to 3 is relevant for most of the fields satellite accounts may cover. It is not so, however, for environmental protection. As already stated, in this field,

only a few goods and services may be considered specific; the same is true for characteristic activities. In the case of the environment, the relation between products, activities and purposes is much looser than in the other fields previously referred to. Environmental protection expenditure is generally defined in terms of objectives pursued through actions or programmes related, for instance, to waste disposal, preservation of air quality, protection of other natural media, public administration in environmental affairs, etc. Within the scope of the actions or programmes, which are included in the functional classification of environmental protection expenditure, current and capital outlays are covered. Items 1 and 2 in this context will not refer to specific goods and services but to goods and services, in general; of course, it is worth showing separately specific goods and services when they exist.

73. Item 4 - Specific current transfers (not counterpart of item 1) and item 5 - Specific capital transfers (not counterpart of item 2 or 3) are the most important components of national expenditure in cases such as social protection or aid for development. In the examples mentioned above, items 1 and 2 refer only to the administrative costs, both current and capital, of the agencies managing social protection or international aid. The core of the expenditure consists of transfers.

74. In other fields, like education and health, the major part of transfers (most of them in kind) are means of financing the acquisition by users of goods and services included in items 1 to 3. These transfers should not be counted twice in the expenditure. However, some transfers or parts of transfers are not used to counterbalance acquisition of products included in items 1 to 3. For example, student grants may serve to finance various outlays in addition to tuition fees or school books. This additional component of students grants is included under item 4.

75. In various situations, there may be subsidies designed to reduce the prices paid by final consumers for certain goods or services, as food, transport services, housing services. They are commonly called consumption subsidies. In the central framework, when these goods and services are considered market products, they are included in final consumption at purchasers' prices. In a satellite account, there are two options. Either consumption (item 1) is valued differently from the central framework in order to include the value of consumption subsidies or consumption is valued as it is in the central framework and specific current transfers (item 4) must include consumption subsidies. Subsidies included in item 4 may also be directed toward reducing the prices of intermediate consumption.

76. In each field a classification of specific transfers has to be established. As it is used for analysing uses and financing as well, this classification covers all specific transfers, independently of whether they are or are not counterparts of item 1 to 3.

77. The total uses of resident units are the sum of the five components above. That part of the uses of resident units which is financed by the rest

of the world by means of transfers or lending is deducted in order to get national expenditure. National expenditure is thus equal to total uses of resident units financed by resident units. It is convenient to distinguish between current and capital uses financed by the rest of the world, in order to facilitate later on the calculation of current and capital national expenditure. Total uses of resident units or national expenditure may in most cases be calculated either gross or net or both.

78. National expenditure, as above defined, does not include transactions in financial instruments. However, for certain types of analysis, like aid for development, loans which are allowed or received at preferential conditions must be accounted for. In any case, benefits resulting, for instance, from rates of interest lower than the market ones are clearly implicit transfers.

79. Uses/national expenditure may be shown by type of products and transfers or by type of purpose (programmes). The main emphasis may be put on one or the other of these two alternatives, or they might be used jointly, depending on the field covered or the aim of the analysis pursued. The approach by programme is particularly relevant in the case of environmental protection or social protection.

80. Table XXI.2, Coverage of National Expenditure in Various Fields, indicates the usual coverage of national expenditure in various fields. As already explained, not all items are relevant in every case. Current uses of resident units include components 1 and 4, capital uses components 2, 3 and 5. Current national expenditure is equal to the sum of components 1 and 4, less item 6. Capital national expenditure is equal to the sum of components 2, 3 and 5, less item 7.

81. Some explanation of the table is needed. Collective consumption for social protection and aid for development refers to the current costs of managing agencies in these fields. Specific current transfers for tourism, transportation, housing and possibly education, health and culture cover subsidies on the relevant products unless they are included under item 1. In many fields, they refer also to transfers to international organizations. Since financing by the rest of the world depends on specific circumstances, no crosses have been entered in table XXI.2. For R & D, a satellite account allows for treating expenditure either as consumption or capital formation or both.

4. Users/beneficiaries

82. For users or beneficiaries, the terminology used may differ from one satellite account to another. "Users" is more relevant to tourism or housing for example, "beneficiaries" to social protection or aid for development, etc. In both cases, the terms refer to who is using the goods and services or benefiting from the transfers involved.

83. At the most aggregated level, the classification of users/beneficiaries is simply a rearrangement of the central framework classification of institutional sectors and types of producers, in which the production function and the consumption function are separated. It may be like the following:

(1) Market producers
(2) Non-market producers
(3) Government as collective consumer
(4) Households as consumers
(5) Rest of the world.

84. Of course, various sub-categories of producers may be distinguished under each main group, either by industry and/or by institutional sub-sector in order to show explicitly the detailed links with the central framework as well as for analytical purposes. For actual consumption, general government is supposed to be the final consumer of collective services produced by itself, on behalf of society as a whole.

85. Households, even individuals, as consumers are the most important type of users/beneficiaries in many satellite accounts. In order to be useful for social analysis and policy, a further breakdown of households is necessary. In the first instance, this may be according to the various sub-sectors that are distinguished in the central framework or using a more detailed or especially adapted socio-economic classification. Moreover, various criteria may be used according to different purposes, like size of income, age, sex, location, etc. For analysis and policy purposes, knowledge of the number of people concerned in each category is essential in order to calculate, for instance, the average consumption or transfer, the number of people who benefit very little or not at all from national expenditure in the field under study, etc.

86. Cross-classifying components of national expenditure and types of users/beneficiaries leads to the table XXI.3, National Expenditure by Components and by Users/Beneficiaries. Crosses indicate cells which may be filled in, if relevant in a given field.

5. Financing

87. Users do not in all cases bear the expenses themselves so that it is necessary to analyse the financing units, that is, the units which ultimately bear the expenses. For this purpose, a classification derived from the central framework classification of institutional sectors, such as the following, may be used:

(1) Market producers
(2) NPIs serving households
(3) General government
(4) Households as consumers
(5) Financial enterprises.

(6) Rest of the world.

88. It can be seen from this list that non-market producers are never considered ultimate financing units. Their costs, net of any secondary sales, are covered by their parent institutional units. Market producers refer to all institutional sectors in their capacity as producers for the market, as in the classification of users/beneficiaries. A separate category is introduced for financial enterprises covering financial corporations and, if any, unincorporated financial enterprises. It refers only to their function of providing other units with funds they gather through financial intermediation or the investment of technical reserves.

89. Table XXI.4, National Expenditure by Components and Financing Units, cross-classifies components of national expenditure and financing units.

90. The identification of the ultimate bearer of the expenses is not always obvious. As the principle of the ultimate bearer of the expense is used in the central framework when attributing consumption expenditure to institutional sectors, one might think that it is a simple matter to apply the same solution here. In fact, the problem is more complicated. Firstly, we have to analyse the financing of capital formation and transfers, not only consumption. Secondly, we have to take into account financing through capital transfers and borrowing. Thirdly, some refinements are needed, even for expenses made out of disposable income. In table XXI.4, the following treatments are used:

(1) Households as consumers are considered to be the financing units for all expenses made out of their disposable income, except for transfers in kind received from the rest of the world and non-government/NPIs sectors. Components in kind of compensation of employees and entrepreneurial income are thus financed by households themselves. Social contributions, as part of compensation of employees, represent means of financing by households.

(2) Market producers finance their intermediate consumption through their sales.

(3) NPIs serving households are treated as ultimate financing units, not the households who pay contributions to them.

(4) General government is treated as the ultimate financing unit, not the units which pay taxes to it. However, as indicated above, social contributions represent means of financing by households.

(5) Transfers in kind received from the rest of the world and possibly non-government/NPI sectors are treated as means of financing by the rest of the world (or non-government/NPI sectors).

(6) Incurrence of liabilities is treated as a source of financing expenditure. When the counterpart of this incurrence of liabilities is a direct acquisition of assets by institutional units other than financial enterprises, the corresponding financing is recorded in the relevant columns 1 to 4 or 6. Acquisition of financial assets by financial enterprises through their intermediation function is considered financing by these enterprises, not the units that own the deposits, for example.

91. In the table, actual final consumption of market products, which is always a use of households, may be financed by general government and NPIs (transfers in kind), possibly the rest of the world and market producers (transfers in kind), financial enterprises (loans), or finally households themselves. Individual consumption of non-market products is financed by general government and NPIs or partly by households. Collective consumption is exceptionally financed by households (see <<paragraph 94>> below).

92. The financing of capital formation is complex. First take market producers - a case like the building of a hotel by an unincorporated enterprise. If the government tries to encourage tourism activities, there may be a capital transfer receivable by the investor, or there may be capital transfers from the rest of the world. A second part may be financed by a loan made by a bank, for example. The residual represents self-financing by the owner of the unincorporated enterprise, through saving or sale of assets. These three components will appear in row 3 and columns 3 (possibly 6), 5 and 4 respectively. The problem is simplest when market producers in a given field correspond very closely to a set of institutional units whose economic activity is essentially a characteristic activity in this field. If big corporations involved in a lot of different activities are concerned, the problem is more difficult. At the limit, in some cases loans and self-financing may have to be grouped together, the total appearing as financed by market producers, either now or in the future, when repaying the loans. 2/

93. When capital formation by government units is involved, the analysis of the financing process may become even more complex, as a government may cover its overall deficit by issuing bonds, for example, which are not intended to finance specific programmes. However, especially in developing countries, loans given by the rest of the world are often specifically directed to identified investment programmes.

94. In table XXI.4, households appear as financing units under item 4, that is, specific current transfers. This covers social contributions which households pay to government out of compensation of employees. A detailed

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2/ Repayments of previous loans raise a general problem. It seems relevant, in most cases, to consider only net loans (that is, new loans less repayments of loans) linked to the financing of a given field as financing provided by financial enterprises. Consequently, self-financing covers present self-finance plus repayments of previous loans.

analysis of households as beneficiaries of social benefits and households as financing social protection through social contributions makes it possible to analyse the redistributional effect of social protection schemes. A part of social contributions covers current cost and eventually capital outlays of social protection institutions; it appears on rows 1.1.2.2 and 3. When tax benefits are estimated and included in social protection accounts in item 4, households are at the same time beneficiaries and financing units, as a redistribution process between various types of households is involved.

95. In the table, financing units are the ultimate bearers of the expenses. In more detailed analyses, transfers between initial, intermediary if any and ultimate financing units have to be shown in order to build up a complete set of accounts for the relevant managing agencies (social protection schemes in the case of social protection accounts).

96. The table shows first how uses of resident units are financed. In some cases the rest of the world may be a source of finance (by means of transfers or net lending). This appears in the relevant rows and the column for the rest of the world. In order to get the financing of national expenditure, the corresponding amounts are deducted in rows 6 and 7.

97. National expenditure is thus equal to the total outlays of resident financing units in the field under study. This is identical to total uses of resident units financed by resident units.

6. Production and products

98. In a satellite account, the main emphasis when looking at production is on the analysis of characteristic activities and producers. As explained earlier, characteristic goods and services are typical of the field under study. The activities in which they originate are called characteristic activities, and producers which carry out a characteristic activity are said to be characteristic producers.

99. The way production units may be analysed in a satellite account has been dealt with in section B and is not repeated here. In a given field, a list of characteristic activities has to be established. This list may include some activities which are also considered characteristic of other fields. Characteristic producers may be defined in various ways. Ideally, they are homogeneous production units belonging either to establishments whose principal activity is a characteristic activity or to establishments which carry out a characteristic activity only as a secondary activity or to ancillary activities. They may also refer to an extension of the production boundary. For the sake of convenience, establishments whose principal activity is a characteristic activity may be covered totally, including their non-characteristic secondary activities. Market and non-market producers are distinguished.

100. Production activity of characteristic producers is studied in detail. This covers the Production and Generation of Income Accounts, the analysis of output by kind of products and number of units produced, the destination of this output (consumption, capital formation, exports) and the labour and fixed assets used. As to labour, in addition to compensation of employees, which may be subdivided according to various criteria (like skill and sex), the number of people employed is shown in detail, again according to various criteria. Fixed capital formation, of course, is covered. Stocks of fixed assets in monetary value and/or physical quantities (number of hospital beds, of primary schools, etc.) are essential.

101. When relevant, the analysis of supply and use of specific goods and services may be inserted in an input-output framework. In that case, classifications of characteristic producers, characteristic products and connected goods and services are detailed, while classifications of other producers and products are compacted.

102. Tentatively, table XXI.5, Satellite Input-Output (Supply and Use table), which is a re-arrangement of the supply and use table of the central framework, suggests how such a satellite analysis might be inserted in an input-output table. In principle, homogeneous units of production are considered for the characteristic activities. Characteristic producers and other producers are separated. Among characteristic producers, market producers cover homogeneous units of production belonging to principal producers (establishments the principal activity of which is a characteristic activity), secondary producers (establishments the principal activity of which is not a characteristic activity) and ancillary activities (the output and input of which must be externalised) separately. The same distinction is made for non-market producers; in addition, a column "Others" under non-market producers refers to a possible extension of the production boundary. Other producers, from which secondary and ancillary activities characteristic of the field under study have been excluded, are grouped altogether (unless it is useful to show the main providers of intermediate inputs or fixed capital to characteristic producers, or suppliers of certain connected goods and services, separately).

103. As indicated above, for convenience the establishments whose principal activity is a characteristic activity may be included in their totality. In this case, the column for principal producers would include establishments. The column for secondary producers, and of course ancillary activities, should continue to refer to homogeneous units of production in order to limit the degree of heterogeneity of the group of characteristic producers. When secondary and/or ancillary output of characteristic products is not significant in size, it could be treated as secondary output of other producers.

104. The supply of characteristic and connected products appears in the rows. The sources are imports and domestic output. The output corresponding to intra-establishment deliveries must be included. If some secondary producers are not included in the relevant column for characteristic producers, their

output is shown in the column for other producers, where the output of connected goods and services also appears. Other products are grouped altogether (unless, again, it is useful to show some detail).

105. In the lower part of the table, the use part of the Production Account and the Generation of Income Account of producers is shown. At the bottom, three rows show gross fixed capital formation, stocks of fixed assets and labour inputs. Final uses are depicted in the relevant columns without any modification of presentation. Alternatively, the columns can be re-arranged and actual final consumption presented first.

7. Full accounts for characteristic producers

106. When analysing a given field in a satellite account, it is generally worthwhile to establish complete accounts for characteristic producers. However, complete accounts may be established only for institutional units. This seeming impasse can be surmounted because in a given field many homogeneous units of production or establishments belong to institutional units whose principal productive activity is a characteristic activity in the same field. In order to extend the analysis, all these institutional units may be regrouped in a sector of characteristic producers. Their accounts may be shown using a simplified presentation, as shown in the example below (balance sheets may or may not be included).

107. As satellite accounts are functionally oriented, the sector of characteristic producers may also cover units which are characteristic producers in the field under study but belong to institutional units whose principal activity is not in this field. To balance the accounts, the operating surplus or mixed income, if any, of these producing units is transferred as property income to their parent institutional units. In the accumulation accounts, the capital formation of these producing units is balanced by an equivalent capital transfer coming from their parent institutional units.

Production and Generation of Income Account

Intermediate consumption	Output
- of characteristic activities	- characteristic output
- of other activities	- other output
Compensation of employees	
- of characteristic activities	
- of other activities	
Taxes on production and imports	
Subsidies (-)	
Consumption of fixed capital	

Operating surplus, net
- of characteristic activities
- of other activities

Mixed income, net
- of characteristic activities
- of other activities.

Other current accounts

Property income	Operating surplus Mixed income
Current taxes on income wealth, etc.	Property income
Other current transfers	Other current transfers
Collective consumption	
Saving, net	

Accumulation accounts

Gross fixed capital formation	Saving, net
- of characteristic activities	Capital transfers receivable
- of other activities	Capital transfers payable (-)
Consumption of fixed capital (-)	
Changes in inventories	
Acquisition less disposals of valuables	
Acquisition less disposals of non-produced non-financial assets	
Net acquisition of financial assets	Net incurrence of liabilities - for financing characteristic activities - others
Other accumulation entries	Other accumulation entries Other changes in net worth

108. In fields such as social protection where distributing transfers is the main economic function involved, the production of services playing only a marginal role, the analysis of units managing the distribution and redistribution processes predominates. It is then simpler to group together all current accounts, the production part of them being simplified by showing administrative costs directly as uses and secondary sales, if any, as resources. If social protection institutions act as producers of health or welfare services and if a satellite account covers both production and redistribution functions, the above presentation of accounts remains relevant. In both cases, the analysis of transfers and their financing is given great importance.

109. Transfers are analysed according to their nature (in cash, in-kind, subdivided in various ways) and the type of risks (sickness, unemployment, etc.). A detailed classification of social protection schemes is also used (basic, complementary or supplementary schemes, subdivided between national, general, special or voluntary schemes for instance).

8. Non-monetary data

110. A satellite account allows for the linkage of physical data to the monetary accounting system. In the central framework this kind of link remains generally implicit, being done only for population and labour inputs where these figures are necessary for calculating a number of per-person indicators like income or consumption and indicators of productivity. Such physical data have been mentioned when going through the functionally oriented satellite account framework. It is worth recalling them here.

111. As output is studied in much more detail than in the central framework, even when it includes a detailed supply and use/input output table, it is generally possible to show meaningful data on the number of units produced or used: physician consultations by kind of physician, hotel-nights of various types, student years in various levels of education, etc. The labour force may be presented in detail: number of people employed in various categories, according to skill and sex, number of hours worked or equivalent person years, number of people in training, etc. Data on existing assets in physical terms are especially interesting in such fields as education, culture, health or housing. In conjunction with labour force data, they constitute well-known social indicators such as number of teachers, of hospital beds or of physicians per ten thousands inhabitants.

112. Another important dimension of non-monetary data refers to users/beneficiaries of the goods and services and recipients of the transfers in question. Those data are especially meaningful in the fields of social concern like education, health and social protection. They require information that is generally less developed than the ones on labour force and assets mentioned above. However, they are indispensable to assess the standard of living of various parts of the population and to look in depth at redistribution policy.

113. Physical data are not to be considered a secondary part of a satellite account. They are essential components, both for the information they directly provide and in order to make the monetary data fully meaningful.

9. Links with the central framework.

114. The tentative framework presented in this section departs little from the central framework standards. Of course this resemblance might be more apparent than real if the amounts related to the various items were different from the ones attached to the same flows in the central framework - for example, where a satellite account is established independently from the central accounts themselves. Normally the assumption is that the same items are represented by the same figures in the central framework and in a functionally oriented satellite account.

115. Many elements shown in a satellite account are invisible in the central accounts. Either they are explicitly estimated in the making of the central accounts, but they are merged for presentation in more aggregated figures, or they are only implicit components of transactions which are estimated globally. For each of the fields mentioned in <<paragraph 51>>, only a small number of figures appear in the central accounts, even when the latter are very detailed. Consequently the first role of a functionally oriented satellite account is to make explicit the implicit figures of the central framework.

116. However, even in a satellite accounting framework as close to the central framework as the one presented above, some degrees of freedom are introduced. In a number of cases, classifications of economic activities, products and purposes have to be adapted to the field under study. This is mostly a problem of presentation. As the coverage of a given field sometimes extends beyond the corresponding aggregated positions in the central classifications (e.g, education and health, health and R & D) or is widely diffused (e.g, tourism or environmental protection), some re-arrangement of the positions of the central classifications has to be made when elaborating classifications for a given field. As a rule, all the links with the central classifications must remain visible. As explained earlier, the proposed classifications of users/beneficiaries and financing units follow this rule.

117. Other margins of freedom are used in this framework. For instance, the output and input of the relevant ancillary activities are externalised, which is a difference with the central framework. This element is always apparent in the list of components of uses (see item 1.2.2 internal intermediate consumption) and in the satellite supply and use table, table XXI.5. The concept of national expenditure is broader - it may include transfers - and narrower - financing by the rest of the world is excluded - than in the central framework.

118. In addition, the framework introduces a number of elements which are not in the central framework as such, but do not conflict with it. Above all, this refers to the introduction of the concepts of characteristic goods and services and connected goods and services, the total of which constitute the specific goods and services. The concept of characteristic producers is also introduced. Also gross fixed capital formation and consumption of fixed

capital make the distinction between specific and non-specific products. Finally, physical data are introduced.

119. A satellite account may use elements which have no equivalent in the central framework. Such elements have not been shown when presenting the satellite accounting framework, because they vary according to specific requirements of the fields. Examples of such elements are classifications of diseases (for consumption of health services and connected products) and of scientific disciplines (for R & D expenditures).

120. The kind of satellite accounts studied in this section may also have recourse to alternative concepts, as was touched upon. The boundary of production could be changed in order to include housework and voluntary work (see the column for other non-market producers in the supply and use table), which would affect, for example, education, health and social protection. All or part of R & D expenditures may be treated as gross fixed capital formation instead of current outlays. The satellite accounting framework presented in this section as a general orientation does not prevent the extension of some satellite accounts in the directions mentioned in this paragraph. On the contrary, these additional dimensions represent valuable enrichments of the analytical power of the national accounting approach.

10. Perspective on the framework

121. The framework presented in this section may cover an important number of fields, as already seen from the illustrative list in <<paragraph 51>>. This framework for functional analyses may not fit all topics which one might like to study in connection with central national accounting. However, the general approach may give valuable inputs for other types of accounts. Specific parts of the functionally oriented satellite framework may also be relevant in other cases, even in the context of the central framework itself, like the satellite supply and use table which is used, with terminological adjustments, for key activities and products.

D. Satellite System for Integrated Environmental and Economic Accounting

1. The scope of environmental accounting

122. In the previous section, environmental analysis was dealt with in the context of functionally oriented satellite accounts as one of several topics that could be pursued in satellite accounts. In this section, environmental analysis is dealt with in the context of a broadened framework that amends several concepts of the SNA to respond to the growing concerns of incorporating environmental criteria in economic analysis.

123. This section deals with the general orientation, design, concepts and classifications of integrated economic and environmental satellite accounts.

In these accounts, SNA aggregates are amended to treat natural resources as capital in the production of goods and services, to record the cost of using - i.e., depleting and degrading - those resources and to record the implicit transfers needed to account for the imputed cost and capital items. The explanations are based to a large extent on the System of Environmental Economic Accounts (SEEA) that is presented in the Handbook on Integrated Environmental and Economic Accounting. 3/ The presentation below should be considered as a description of the present state of the art of integrated economic and environmental accounting, which may evolve over time as a result of continuing discussions.

124. The section is included to guide countries in responding effectively to the current emphases in policy making and analysis on environmentally sound and sustainable economic growth and development and to help national accountants in elaborating environmental satellite studies which take the national accounts as a point of departure. The section shows how amended accounts could deal in a compatible manner with economic and environmental concerns and thus make operational the concepts of sustainable growth and development. The satellite studies should respond effectively to the two major drawbacks of conventional national accounting that are often mentioned: the neglect of new scarcities of natural resources which threaten the sustained productivity of the economy and the degradation of environmental quality and consequential effects on human health and welfare.

125. Insofar as consensus has been reached, relevant parts of the central framework of the SNA take into account aspects of environmental accounting. In particular, many cost and capital items of accounting for natural resources are identified separately in the classifications and accounts dealing with stocks and other volume changes of assets. These features of the SNA facilitate the use of the System as a point of departure for environmental accounting. However, several elements of the SNA, particularly those in the account for other volume changes, would need to be broken down further and reclassified, and other elements would have to be added for the specific purposes of environmental accounting.

126. In the SNA, only produced assets, including inventories, are explicitly taken into account in the calculation of net value added. The cost of their use is reflected in intermediate consumption and consumption of fixed capital. Non-produced natural assets - such as land, mineral resources and forests - are included in the SNA asset boundary insofar as they are under control of economic activities. However, the cost of their use is not explicitly accounted for in production cost. This may either imply that the price of the products does not reflect such cost or, if it does - as may be the case for some depletion cost - such cost is not separately identified but lumped

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3/ United Nations, Integrated Environmental and Economic Accounts (an interim report), Handbook on National Accounts Series, New York, 1992. The Handbook has been prepared by the UN Statistical Division with the assistance of a consultant and in close coordination with the SNA.

together with other unidentified elements in the residual derivation of operating surplus.

2. Alternative approaches to environmental accounting

127. Most systems of environmental accounting now under discussion broaden SNA concepts of cost and capital formation and accordingly amend value added in order to encompass environmental cost and the use of natural assets in production. However, within this general orientation, the several existing approaches differ considerably in terms of methodology and environmental concerns addressed. The SEEA synthesizes as far as possible the various approaches and integrates them into one comprehensive approach.

128. There are now three main approaches to environmental accounting, and they complement and overlap each other. The first one, generally referred to as natural resource accounting, focuses on accounts in physical terms. The second approach, which is linked to national accounts and is in monetary terms, is generally called satellite accounting. It identifies the actual expenditures on environmental protection and deals with the treatment of environmental cost to natural and other assets caused by production activities in the calculation of net product. Monetary satellite accounting is generally more limited in coverage of environmental concerns than physical resource accounting. The third approach is a welfare-oriented one. It deals with the environmental effects borne by individuals and by producers other than the ones causing these effects. The latter may often be much larger than the cost caused and do not affect net product but rather net income through transfers of environmental services.

129. Of the three approaches, physical resource accounting is the most advanced in terms of practical implementation. Experience with monetary satellite accounting is much more recent, and many controversies still surround this approach. The least consensus exists with regard to the welfare approach to environmental accounting.

a. Natural resource accounting in physical terms

130. Natural resource accounting focuses on physical asset balances - i.e., opening and closing stocks and changes therein - of materials, energy and natural resources. Where applicable (for selected pollutants), it may also include changes in environmental quality of natural assets in terms of environmental (quality) indices. Several examples, developed by individual countries or sponsored by international organizations, now exist. Also, the multi-purpose Framework for the Development of Environment Statistics, developed by the United Nations, includes the environment statistics elements from which the physical asset balances could be constructed, although it does not include the balances themselves. SEEA, which shows the links between physical and monetary accounts, includes natural resource accounts as a module.

b. Environmental accounts in monetary terms

131. Monetary environmental accounts in a restricted sense only identify separately within the national accounts the actual expenditures on environmental protection. In some instances, these expenditures are externalized by treating ancillary environmental protection activities as separate establishments. Monetary environmental accounts in this restricted sense would also include the functional approach to environmental accounting dealt with in the previous section.

132. A broader interpretation of monetary environmental accounting includes the environmental adjustments developed in projects carried out in several resource-oriented developing countries. In these studies, GDP is adjusted for selected environmental costs, including the cost of oil depletion, deforestation, depletion of fishstock and the cost of soil erosion. While these studies are based on detailed analyses in physical terms, distinguishing between a variety of species of timber, fish, and different types of soil based on geographical location and agricultural use, the ultimate focus is on the adjustment of GDP. The studies do not deal with an explicit allocation of the environmental adjustments between activity and expenditure components of GDP.

133. A comprehensive approach to adjusting national accounts aggregates is followed in case studies based on SEEA, which were carried out in two developing countries, and in a SAM approach prepared for a developed country. The comprehensive accounting approaches take the SNA as a point of departure and thus stay very close to the analytical orientation of economic analysis. At the same time, they emphasize the importance of recording physical flows and stocks in support of the monetary environmental economic analysis.

134. The comprehensive accounting approaches all allocate the environmental impacts of depletion and degradation to separate economic activities causing these environmental impacts and to expenditure components corresponding to quantitative and qualitative changes in natural assets, reflecting the immediate effects borne. SEEA and the case studies mainly consider the effects on production analysis, identifying the environmental cost of depletion and degradation 4/ caused by different economic activities and showing the corresponding effects on natural and other assets. SEEA

4/ SEEA does not distinguish between depletion and degradation, but rather between quantitative use of natural assets. In the first case reference is made to the use of environmental goods and in the second case to the use of environmental services. In order to be as close as possible to the concepts and terminology used in the SNA, it has been assumed in this section that depletion approximately coincides with the quantitative use and degradation with the qualitative use of natural assets. While the distinction between depletion and degradation is made, it should be understood that economic activities may result in depletion and degradation at the same time.

furthermore introduces an enlarged concept of capital accumulation, which not only reflects depletion and degradation but also the transfer of natural resources to economic uses. The environmental SAM, in addition, considers the effects of present and past degradation borne in a concept of environmentally adjusted national income.

c. Welfare and similar approaches

135. One welfare approach, instead of dealing with the cost caused by production activities and their effects on capital used in production, focuses on the environmental impacts of cost borne or, in a broader sense, on well-being. The approach considers the free environmental services provided by nature to producers and consumers and the subsequent damage borne by them. The environmental services provided free and the damage borne are implicitly considered as transfers by and to nature, which increase or decrease, respectively, environmentally adjusted net national income.

136. Another approach is based on the concept of environmental sustainability standards and on estimating the necessary avoidance or restoration costs to meet these standards. The approach does not deal with the immediate environmental impacts of production during the present accounting period, but rather with those impacts incurred over an unspecified length of time. The approach suggests that the cost should be charged to those industries that are able to absorb such cost given the price of their products; these are not necessarily the industries which caused the degradation in the first place.

3. General framework of environmental accounts and the SNA

137. Table XXI.6, Basic Structure of SEEA, shows SNA concepts together with alternative concepts used in environmental accounts. For purposes of explanation, a generalized and simplified version of SEEA is used to present environmental accounts. The use of the SEEA framework to present environmental accounting and the relation to the SNA is convenient as SEEA was developed in immediate relation to the SNA so that its concepts and classifications are more closely linked to those of the SNA than is the case for any other environmental accounting system. Nevertheless, format, concepts and classifications of SEEA should be considered as work-in-progress, as many of its elements continue to be discussed among national and environmental accountants.

a. SNA framework

138. The flow and stock items of the SNA are shown in the shaded area of table XXI.6. The columns of the table related to flows are a column (1) for production, covering output (P), intermediate consumption (Ci), consumption of fixed capital (CFC) and net domestic product (NDP); a column (2) for the rest of the world, which includes exports (X) minus imports (M) and a column (3) for final consumption (C). The rows of the table referring to the SNA flows are a row (ii) for supply, including output and imports; a row (iii) for economic uses, including elements for intermediate consumption, exports, final consumption and gross capital formation (Ig); a row (iv) for CFC and, finally, a row (v) for NDP, which presents the elements that define the national accounts identity between NDP and the expenditure categories. The SNA column (4) for asset balances of produced assets includes the opening and closing stocks of produced assets ($Ko_{p.ec}$ & $Kl_{p.ec}$) and the elements explaining the change between the two, i.e., net capital formation (I= Ig - CFC), holding gains/losses on produced assets ($Rev_{p.ec}$) and other changes in volume of produced assets ($Vol_{p.ec}$).

139. The asset balances in the SNA area cover all economic assets, and therefore include the assets covered by column (5) for non-produced natural assets. The elements of this column, however, do not figure in the calculation of NDP as all changes in non-produced natural assets between opening and closing stocks ($Ko_{np.ec}$ & $Kl_{np.ec}$) are "explained" in the SNA as holding gains/losses ($Rev_{np.ec}$) and as other changes in volume of assets ($Vol_{np.ec}$).

b. The SNA framework extended to environmental accounts

140. The non-shaded area of table XXI.6 show the amendments to the SNA needed to arrive at alternative environmental accounting concepts. These are two types of amendments. First, column (6) is added to record in monetary and economic terms the effects of economic activities on non-produced natural assets such as air, water and virgin forests that are not included as economic assets in the SNA. Second, two rows (vi-vii) are added, for the use of non-produced natural assets by depletion and degradation, and for other accumulation of non-produced natural assets, which includes the transfer of natural assets to and between economic uses. Another row (viii) is included to derive an environmentally adjusted concept of net domestic product (EDP). The items of environmental accounting are presented in the cells corresponding to the additional rows and columns. Although the additional SEEA elements could be interpreted in physical as well as monetary terms, below they are mainly explained in monetary terms as SEEA is linked in table XXI.6 with SNA concepts that are expressed in monetary terms.

141. In row (vi) related to the use of non-produced natural assets, an additional element (Use_{np}) has been included in the column for production. This is the monetary valuation of the use of non-produced natural assets in production; it is the sum of the counterpart items in columns (5) and (6)

representing, respectively, the use of non-produced natural assets that are economic assets in the SNA sense ($-Use_{np.ec}$) and the degradation of other natural assets that are not economic assets ($-Use_{np.env}$). The use of non-produced economic assets ($-Use_{np.ec}$) includes the depletion of minerals, the extraction of timber from forests that are economic assets and the effects on productivity of those forests and agricultural land of soil erosion, acid rain, etc. The deteriorating effects of air pollution on buildings and structures and the effects of soil erosion on roads and other degrading effects on produced assets are not included as they are assumed to be reflected in CFC. The use of natural assets that are not economic assets ($-Use_{np.env}$) covers the non-sustainable extraction of fishstock from oceans and rivers, extraction of firewood and lumber from tropical and other virgin forests or hunting of animals living in the wild and also the effects of emission of residuals on the quality of air, water, fishstocks, wild forests, and the effects of other economic activities (recreation, agriculture, transport, etc.) on eco-systems and species habitat.

142. Other accumulation in row (vii) records the transfer of non-produced natural assets to economic uses as a change in the stock of non-produced economic assets ($I_{np.ec}$). The counterpart of this increase in economic assets is the reduction of natural assets other than economic assets ($-I_{np.env}$). This counterpart item has been included in order to maintain accounting identities in the table, and should be interpreted solely as the economic valuation of changes in the natural environment and not as an ecological damage value. $I_{np.ec}$ would include the transfer of land to economic uses, the net additions to the proven mineral reserves, the conversion of wild forests to timber tracts or agricultural land, and the conversion of fishstocks to economic control. If deterioration takes place at the same time that natural assets are incorporated as economic assets, the deterioration is not recorded in the other accumulation row, but is included as part of uses of natural resources. If this deterioration takes place before the transfer, it is recorded as the use of an asset in the environment ($-Use_{np.env}$), and if deterioration takes place after, it is recorded as uses of natural resources that are economic assets ($-Use_{np.ec}$). As the elements of row (vii) for other accumulation are included in the SNA in other volume changes and in SEEA as explained above, the content of other volume changes is reduced in SEEA as compared with the SNA.

143. The incorporation of the use of non-produced natural assets (Use_{np}) as additional cost in the column for production results in an EDP, presented in row (viii), which is lower than NDP. The elements in row (vii) for other accumulation do not affect EDP.

144. On the expenditure side, a new concept called net accumulation is introduced in SEEA to replace net capital formation in the SNA. It is in row (viii), separately for produced assets ($A_{p.ec}$), non-produced economic assets ($A_{np.ec}$) and other natural assets ($-A_{np.env}$). For produced assets, it is the same as net capital formation (i.e., $A_{p.ec} = I$). For non-produced economic assets, it reflects the net effects of negative depletion and degradation and positive additions of natural assets that are transferred to economic uses

(i.e., $A_{np.ec} = -Use_{np.ec} + I_{np.ec}$). For natural assets other than economic assets, it could be considered as the economic valuation of the impact of economic activities on the environment and it is the sum of negative depletion and degradation effects ($-Use_{np.env}$) and negative effects of incorporating natural assets as economic assets (i.e., $-A_{np.env} = -Use_{np.env} - I_{np.env}$).

145. If net accumulation replaces net capital formation, the national accounts identity between NDP and final expenditures changes. In the SNA this identity, as reflected in row (v) of table XXI.6, is:

$$NDP = C + I + (X - M).$$

If net capital accumulation in economic assets ($A_{p.ec} + A_{np.ec}$) replaces net capital formation (I), the identity as reflected in row (viii) becomes:

$$EDP = C + (A_{p.ec} + A_{np.ec}) - A_{np.env} + (X - M).$$

In order to maintain the identity, the negative element for the economic counterpart of changes in natural assets other than economic assets ($-A_{np.env}$) is added. This implies that expenditures and, in particular, net capital accumulation of economic assets are only partly derived from net product of economic activities reflected in EDP; an important part of the expenditures may reflect the transfer of environmental assets and/or their services to economic activities. This can be shown more clearly by re-arranging the terms in the above EDP identity as follows:

$$EDP + A_{np.env} = C + (A_{p.ec} + A_{np.ec}) + (X - M).$$

4. Details on environmental amendments to SNA framework, concepts and classifications

146. In the overview of the environmental accounting frameworks above and in the presentation of table XXI.6, several new concepts were introduced. This section specifies these concepts more precisely, explains why they were introduced and presents alternatives used in SEEA and other environmental accounting approaches. Where necessary, reference is made to the rows and columns of table XXI.6.

a. Alternative frameworks for environmental accounts

147. Alternative accounting approaches described earlier are reflected in different versions of SEEA. For instance, resource accounting focuses mainly on recording information reflected in the asset balances of non-produced natural assets included in columns (5) and (6) of table XXI.6, without explicitly entering into the counterpart cost calculations included in column 1. One of the approaches to monetary accounting mentioned above, on the other hand, focuses on the calculation of EDP as recorded in column 1, mainly taking into account depletion concerns. All other approaches, including the SAM

approach, cover the same ground as SEEA, though their formats may differ. The SAM approach is a matrix presentation of the SEEA framework of supply and use and asset balances of table XXI.6. The welfare approaches fall outside the framework, as they deal with environmentally adjusted national income, which reflects transfers in kind of free environmental services received and damage incurred (transfers paid).

b. Asset boundary and classification

148. The most important amendment introduced into environmental accounting as compared with the SNA is the extension of the asset boundary. In the SNA, natural assets are included only if they provide economic benefits to the owner, a characteristic that manifests itself through being controlled by an institutional unit. This often means explicit ownership, subject to government legislation in the case of natural forests, and/or availability of a market price. These assets are referred to in the SNA as economic assets. In SEEA, the asset boundary is defined to be much wider. It includes in principle all natural assets; some may directly participate in production activities while others may be affected by environmental impacts of economic activities. (SEEA does not include human capital.) The SNA asset boundary only includes economic assets as dealt with in columns (4) and (5) of table XXI.6. The SEEA asset boundary comprises all natural assets including those that are economic assets and are covered in columns (4) and (5) and other natural assets that are represented by column (6) of the table. SEEA, however, does not distinguish between natural assets that are economic assets and those that are not, focusing on environmental impacts irrespective of particular institutional arrangements of ownership and control.

149. The main headings of the SNA and SEEA are presented in table XXI.7, Classification of Natural Assets in SNA and SEEA, where they are related to each other. The two classifications are compatible, as they were developed in close coordination with each other. However, as the SNA includes a lesser number of natural assets, their detail and structure differ. Nevertheless, the SNA classification of natural assets can be used as a point of departure to arrive at the extended coverage and classification of natural assets in SEEA.

150. The table shows that some asset categories in the SNA and SEEA are identical, some others are closely related but have a different coverage and still others are not included in the SNA but are included in SEEA. The assets categories that have identical coverage are cultivated assets such as orchards and plantations, which are treated as fixed assets, and work in progress on cultivated assets including agricultural crops and livestock, which are treated as inventories in both systems. Also, the subsoil assets category is identical in both classifications. The coverage is based on the definition of proven reserves: "the estimated quantities at a specific date, which analysis of geological engineering data demonstrate, with reasonable certainty, to be recoverable in the future from known reservoirs under the economic and operational conditions at the same date". The coverage of subsoil assets

implied by this definition is the same as what is implied by the definition of economic assets in the SNA. On the other extreme, air is included in SEEA because it is affected by economic activities, but it is not included at all in the SNA as (at present) it does not satisfy the SNA criteria of economic assets.

151. Between these two extremes are all other categories of non-produced natural assets, which are similar in the two systems but have different coverage. Land in the SNA includes associated water surfaces such as lakes and rivers, which are generally associated with recreational land, and in some instances also groundwater. As SEEA deals with the effects of economic activities on the quality of water in rivers and lakes and on the quantity and quality of available ground water, it excludes these categories from land and includes them as subcategories under the category of water. Consequently, the category of water in SEEA is much broader than the SNA category AN.214 Water resources; the SEEA category includes (not shown in the table) sub-categories for ground water, water of lakes, rivers, etc., coastal water, and ocean water. The SNA category is mainly restricted to aquifers that are controlled by human activities. On the other hand, land includes in SEEA the eco-systems, which are not explicitly included as economic assets in SNA analysis, but are aspects of land that are very important for environmental analysis dealing with such effects as soil erosion and the effects of acid rain on the quality of forests and land in general. The coverage of non-cultivated biological resources in the SNA and wild biota in SEEA is also different. Non-cultivated biological resources in the SNA would generally include forests, fishstocks and animal herds in the wild that are controlled by human activities. In SEEA wild biota would, in principle, include all forests (including virgin forests), all fishstocks and all animal herds whether they are controlled by human activities or not, as all can be affected by human activities.

152. The asset classification such as that of SEEA, which is presented in table XXI.7, is needed in environmental accounting in order to cover fully depletion, degradation, and other accumulation i.e., transfer of natural assets to economic activities. A more restricted coverage may be selected if the analysis were limited to environmental impacts that only affect specific natural assets. For instance, some studies have dealt only with oil exploitation, deforestation, depletion of fishstocks and land erosion. On the other hand, the case studies based on the SEEA mentioned earlier dealt with a wider range of natural assets and the environmental impacts on them, including ground water depletion and air and water pollution. Of course, more selective environmental accounting could focus on only those natural assets that are economic assets; in that case the natural asset boundary would be the same as that of the SNA. One version of SEEA which applies a market valuation approach deals explicitly with this case.

c. Environmental cost

153. SEEA identifies two types of environmental cost. The first type is the imputed cost for degradation and depletion. The second type is the actual cost incurred in the form of environmental protection expenses. The content and classification of both are dealt with below.

(i) Use of non-produced natural assets

154. The use of non-produced natural assets is introduced as an additional cost in SEEA when extending the SNA to environmental accounting. The additional imputed cost is shown as a use of natural resources in row (vi) in table XXI.6, including allowances for depletion and degradation.

155. Before discussing the treatment of depletion and degradation, it should be recognized that there is much more consensus with regard to amendment of the SNA for depletion than degradation. The main reason is that depletion allowances already have found their way into commercial accounting practices and are thus implicitly reflected in the market prices of depleted assets. Commercial accounting practices generally have not been developed for externalities and consequently there is less consensus on this further amendment of the SNA in environmental accounting. There is also less consensus with regard to the coverage of the concept of capital accumulation to replace the capital formation concept in environmentally sustainable growth analysis.

156. Depletion and degradation of economic assets are recorded in the SNA in the items of other accumulation entries presented in the top panel of table XXI.8, Other Accumulation Entries of SNA Related to Use of Non-produced Natural Assets. They refer to parts (which are separate building blocks in SEEA) of SNA items K.3 Economic appearance of non-produced assets and K.62 Other economic disappearance of non-produced assets, and with regard to depletion, to the entire SNA item K.61 Depletion of natural assets. The extent to which these uses of natural economic assets - in particular the degradation and quality effects included in items K.3 and K.62 - are recorded in the SNA depends on whether market prices of the assets identify these uses and whether they can be separated from other price changes in the assets. Uses of natural assets that are not economic assets are not recorded in the SNA.

157. The depletion allowances included in row (vi) of table XXI.6 cover mainly depletion of economic assets. The reason is that when an asset is being depleted to a major extent it would most probably satisfy either one or more of the SNA criteria concerning the asset boundary mentioned above - i.e., market prices would most probably develop, ownership would be enforced and consequently the asset might be considered as being controlled human activities.

158. The depletion allowance, however, is not restricted to economic assets only. It may also include depletion of uncontrolled forests in some countries for the purpose of firewood collection; the firewood is often not sold nor ownership of the forests enforced. The same may apply to uncontrolled depletion of fishstocks. Also lumber extraction in parallel with uncontrolled land clearance to acquire land for agriculture or urban settlements would lead to depletion of non-produced assets that are not economic assets at the time the land clearance takes place. In all these instances, the assets may not be considered as economic assets in the SNA sense as the exploitation of the assets is uncontrolled; even though exploitation may be on a large scale, those assets still would be dealt with as other natural assets. In those instances a depletion allowance is calculated in SEEA, except if the depletion in the case of wild biota is within the bounds of natural growth and the depleted assets would be naturally replaced.

159. The depletion allowances could be considered as payments for the extraction of non-produced assets (such as minerals) which are in stock either as economic assets or as natural assets outside the economic asset boundary. Depletion of non-produced natural assets is therefore considered in SEEA as cost and at the same time treated as negative changes in inventories. Alternatively, it may be treated not as cost, but rather as negative output. The latter treatment is thought to be more appropriate by some as this treatment would result in an output value for extraction industries which would only include value of the extraction activity without including the value of the mineral being extracted.

160. If stock changes are in economic assets, such as mineral reserves and timber tracts which are under control of human activities, the SNA rules on changes in inventories apply. Any changes in the value of minerals extracted during the accounting period is reflected in changes in inventories of non-produced assets, in the same way as holding gains and losses of produced goods. On the other hand, if the stock changes are in natural assets other than economic assets, such as fishstock in the ocean or timber in wild forests, no price changes will be reflected in changes in inventories in the SNA because natural assets other than economic assets are not valued in the SNA.

161. When depletion of non-produced economic assets such as minerals takes place, the mineral deposits are first transferred to economic uses (in row (vii) of table XXI.6) before the use of non-produced natural assets is recorded. When natural assets that are not economic assets are depleted, such as catching of fish from rivers, lakes and oceans or collection of firewood from virgin forests, it is assumed that transfer to economic uses and depletion take place at the same time; the assets are incorporated as economic assets only for the amount of depletion and degradation at the moment of extraction or harvesting.

162. Degradation effects are included as imputed cost, no matter whether these affect natural assets that are economic assets such as land under cultivation and controlled forests or other natural assets such as virgin

forests, water, air and land other than cultivated land. The effects of degradation may include the deterioration of natural assets as a result of their use as a "sink" for residues or as a consequence of other degrading activities, such as recreational uses. The deterioration of produced assets due to degradation is assumed to be reflected in consumption of fixed capital (CFC) which is already accounted for in the SNA.

163. In row (viii) of table XXI.6 it is assumed that all degradation is caused by production and thus the value of use of non-produced natural assets is deducted in its entirety from the value of output in order to arrive at EDP. The justification for deducting the whole value of disposal services is based on a number of specific treatments that are adopted in the SEEA.

164. One convention of SEEA concerns environmental degradation related to final demand. Environmental degradation by households of land, water and air through the use of fossil fuels, generation of garbage and as a consequence of recreational activities is treated in SEEA as a cost of internal household production activities, which for this purpose are treated as part of an extended production boundary. Environmental degradation caused by fixed assets abandoned in the environment at the end of their useful economic life is allocated as cost of degradation to the producers owning those fixed assets. Both adjustments reduce EDP as compared to NDP.

165. Another convention of SEEA relates to environmental degradation "imported from" or "exported to" neighbouring countries. The net external degradation effect incurred by the country, resulting from the two gross flows is treated in SEEA as a further deduction of environmental cost to arrive at EDP. An alternative treatment found, for example, in the SAM approach to environmental accounting mentioned earlier would be to treat this net external environmental impact as the provision of free environmental disposal services to the rest of the world, which would only be deducted in the derivation of environmentally adjusted net (national) income aggregates. In this approach the net export of environmental disposal services would be treated in a manner similar to the treatment in the central framework of the SNA of net import of labour services, which are not deducted to arrive at NDP but taken into account in the derivation of national income.

(ii) Environmental protection expenses

166. In addition to the disposal services provided by the environment "free of charge" in the case of degradation, actual expenses are incurred to avoid environmental degradation or eliminate the effects after degradation takes place. Increasingly enterprises explicitly produce such services on a commercial basis. In many instances, however, the services are produced as the ancillary activities.

167. The scope of environmental protection services is defined in table XXI.9, Two Digit ISIC Categories that Identify Environmental Protection Services, which identifies the specific ISIC categories that are related to

environmental protection activities. ISIC, however, does not include sufficient detail for the analysis of environmental protection and therefore a further tentative breakdown is proposed in SEEA. The additional categories are included in the table and indicated with an asterisk. More comprehensive classifications of environmental protection expenditures are being developed by international organizations and further modifications of the breakdown in table XXI.9 may result from considerations of those.

168. In order to facilitate this analysis, environmental protection expenses made in the context of ancillary activities carried out by producers are externalized in one version of the SEEA, in the same manner as this was done in the functionally oriented satellite approach described in section C. The ancillary activities are treated as separate establishments with an identifiable output and intermediate cost. The externalization of ancillary environmental activities is done in order to measure and evaluate more comprehensively the efforts that actually have been made to combat environmental degradation and its effects. In terms of table XXI.6, this would be reflected in a further breakdown of the production activities in column (1), identifying environmental protection services, and recording output and subsequent use of environmental protection products separately in the rows of supply (i) and economic use (ii). As a result, total output and intermediate consumption of the producers which carry out environmental protection activities as ancillary activities are adjusted upwards as compared with the SNA; NDP, however, is not affected by this treatment in SEEA.

169. SEEA generally only considers those environmental protection expenses which are in immediate response to effects caused by production. It excludes environmental protection expenditures responding to environmental effects borne. They would only be considered in welfare approaches which are not further elaborated in SEEA. This is the reason why household expenses on environmental protection are not considered; they respond to impacts borne. They are dealt with in SEEA in the same manner as in the SNA.

170. An exception is made for environmental protection services produced as ancillary activities by government, which are included in the SNA as part of non-market output. They are identified in SEEA as separate establishments. Their output is supplied to government consumption if the government cleans up the effects of its own pollution, or alternatively to capital formation if such activity is interpreted as helping producers to remove the effects of degradation caused by them. This treatment would apply to government environmental protection activities, such as cleaning of lakes and rivers, restoring land polluted by industry, affected by mining operations and affected by military activities, etc., independent of whether they are aimed at eliminating the effects of degradation caused by others or by the government itself.

d. Net capital accumulation

171. SEEA introduces a capital accumulation concept as an alternative to capital formation in the SNA. SNA capital formation includes changes in the stock of produced assets used in production that are caused by economic decisions. Capital accumulation in SEEA includes not only economic-decision-related changes in the stock of produced assets (that is, capital formation) but also economic-decision-related changes in non-produced natural assets that are explicitly used in production. Such changes include the reductions in the capital stock as a result of depletion and degradation shown in the top panel of table XXI.8, and, in addition, the incorporation of natural assets as economic assets and the transfer of natural assets between economic uses as a result of economic decisions taken in connection with production activities.

172. The middle of table XXI.8 identifies additional entries: additions minus reductions in the level of subsoil resources (part of K.3 minus part of K.62), transfer of other natural assets, such as forests, to economic activities (also part of K.3) and classification changes due to economic decisions (part of K.12). The last item covers changes such as in the use of land (for example, between agricultural land and land for urban and rural settlements).

173. The other accumulation entries not included in the SEEA concept of capital accumulation are in the lower panel of table XXI.8. Catastrophic losses due to events such as wars and natural disasters are not included in the concept of net capital accumulation unless they are caused in connection with production activities; as they are not related to economic decisions, they remain with other accumulation entries in the lower part of the table. Also, natural growth of non-cultivated biological resources is not included in net capital accumulation.

e. Valuation

174. Valuation is one of the more controversial aspects of environmental accounting. SEEA deals with three alternatives: market prices, maintenance cost and contingent valuation. Market prices are in SEEA the central valuation and the principles of market valuation are the same as in the SNA. They are applied to stocks of non-produced natural assets that are economic assets in the SNA, to changes therein as a result of uses of natural assets, and also to the depletion of natural assets that are not economic assets, such as the extraction of fish from the oceans and firewood from virgin forests.

175. While market valuation is the same in the SNA as it is in SEEA, it has been more extensively elaborated in SEEA insofar as natural resources are concerned. In the context of discussing amendments to the SNA to arrive at environmental accounts, it is worthwhile to highlight a number of selected aspects of the market valuation.

176. Market values are used in the SNA and SEEA to value stocks of economic non-produced natural assets. The market price valuation of depletion and degradation of natural assets that are economic assets in the SNA is in both systems consistent with the valuation of the stocks of the corresponding non-produced (natural) economic assets. The only difference between the SNA and SEEA is that the use of non-produced natural economic assets is recorded in the SNA as other volume changes, while in SEEA the cost of depletion and degradation is deducted in the derivation of EDP and reflected in capital accumulation.

177. Opening and closing stocks of other non-produced natural assets that are not economic assets in the SNA are not valued in market prices in either system; they are recorded in SEEA, but only in physical terms. Also degradation of air and water are not valued in market prices in either system, as these are uses of non-produced natural assets that are not economic assets. However, SEEA - not the SNA - does not exclude from its market valuation all uses of natural assets that are not economic assets. It includes, for instance, the depletion of fishstock from the ocean or extraction of firewood from virgin forests as the fish and firewood have a market value. This implies that the item - $Use_{np.env}$ in column (6) of table XXI.6 would only have a limited coverage in the market price version of SEEA, as it would include only depletion of natural assets that are not economic assets, but not degradation.

178. In valuing the changes in the stock of non-produced assets at market prices, two valuation methods are utilized in practice, mainly in the context of depletion. One is the so-called net rent approach. It values the units extracted on the basis of the difference between output and all cost - including labour cost and a normal profit margin - incurred as a result of depletion. The other is the so-called user cost approach, which values the units extracted on the basis of only a part of net rent, namely that part which if reinvested would generate a permanent income stream equal to the loss of income generation capacity through depletion.

179. Since the cost of depletion is more often reflected in market prices than the cost of degradation, the SNA and the market valuation version of the SEEA incorporate depletion cost more fully than they do degradation. Insofar as the market recognizes the cost of degradation when specifying different prices for degraded natural assets such as contaminated land, the degradation cost is treated as other volume changes in the SNA. As it may be difficult in practice to separate these changes in the quality of assets due to degradation from price changes, SNA accounting may not attempt such separation. However, the SEEA - given its different analytical focus - identifies these quality changes in assets separately, deducting this value in principle from value added generated and capital accumulation.

180. The two alternative valuations used in SEEA, i.e., maintenance cost and contingency valuations, are only applied to uses and not to stocks of non-produced natural resources. The uses that are valued in this manner include uses of natural resources that are economic assets in the SNA sense as well as

uses of other natural resources, such as contamination of air and water and depletion of fishstocks in the ocean. The maintenance valuation in these instances is based on the cost which would have been necessary to maintain natural assets at their level prior to depletion or degradation. The contingency valuation is based on the willingness to pay principle. It is used in SEEA to value the environmental cost borne by households, which is deducted in the derivation of one of the alternatives of EDP. This differs from some other approaches, which deduct this cost outside the framework of table XXI.6 in the derivation of environmentally adjusted national income instead of EDP.

181. Use of other than market valuation in SEEA leads to a number of valuation inconsistencies within SEEA. To some extent these reflect potential disequilibria resulting from market prices not recognizing environmental cost. One of these inconsistencies has been identified explicitly in SEEA. It is the discrepancy caused by incompatibilities between the market valuation of opening and closing stocks of non-produced natural assets that are economic assets in the SNA sense and the valuation of the corresponding flows which include the non-market valuation of uses of these assets and other natural assets that are not economic assets, in terms of maintenance and contingency cost. The valuation discrepancy could be interpreted as the quality changes of all natural assets that are not taken into account in the market valuation of economic assets. The discrepancy will be less the better the quality changes in the assets due to degradation are reflected in sub-items of K.62 covering negative effects of degradation of land and other non-produced economic assets, as well as the positive effects due to restoration activities (see table XXI.8).

182. Another inconsistency concerns the compatibility between the valuation of output that is based on market cost and the valuation of inputs that include not only economic uses but also environmental uses that are not taken into account in the valuation of output. Whether this incompatibility is important depends on whether some assumptions implicit in the SEEA treatment are realistic. The first assumption is that the additional environmental costs that are imputed would not affect the prices of output of the products concerned if these costs were explicitly taken into account in the market prices. In the case of degradation, there is a further assumption that if restoration activities were actually carried out, the resources needed would be available in sufficient supply and would not compete with the resources available for the production of other goods and services. Based on these assumptions, additional expenditures imputed to account for the cost of depletion and degradation therefore reduce value added and EDP to the full extent without taking into account any effects resulting from changes in prices of output and intermediate inputs.

183. The two assumptions are probably more realistic for depletion than for degradation. Producers of minerals and other products of depletable reserves, when calculating their profits and the part they would have to reserve in order to secure future income streams, may already have taken the depletion allowance into account. Incorporation in environmental accounts of such

allowance would thus merely adjust net value added of the production in question to a more realistic level. However, even in case of pollution many corporations may have made allowances in the cost for possible liability for environmental contamination.

TABLE XXI.1. Components of uses/national expenditure

20-Jul-92
10:28

Satellite tables

COMPONENTS OF USES/ NATIONAL EXPENDITURE	TOTAL
1. Consumption of specific goods and services	
1.1 Actual final consumption	
1.1.1. Market products	
1.1.2. Non market products	
1.1.2.1. Individual	
1.1.2.2. Collective	
1.2. Intermediate consumption	
1.2.1. Actual intermediate consumption	
1.2.2. Internal intermediate consumption	
2. Capital formation in specific goods and services	
3. Fixed capital formation of characteristic activities in non specific products *)	
4. Specific current transfers (not counterpart of item 1)	
5. Specific capital transfers (not counterpart of item 2 or 3)	
Total uses of resident units	
6. Current uses of resident units financed by the rest of the world (less)	
7. Capital uses of resident units financed by the rest of the world (less)	
National expenditure	

*) and their acquisition less disposals of non-produced non-financial assets

TABLE XII.2 Coverage of National Expenditure in various fields

20-Jul-92
10:28

COMPONENTS OF USES/NATIONAL EXPENDITURE	Culture	Education	Health	Social protection	Tourism	Environmental protection	Research and development	Aid for development	Transportation	Data processing	Housing
1. Consumption of specific goods and services								-			
1.1 Actual final consumption											
1.1.1. Market products	X	X	X		X	X			X	X	X
1.1.2. Non market products											
1.1.2.1. Individual	X	X	X			X			X		X
1.1.2.2. Collective	X	X	X	X	X	X	X	X	X	X	
1.2. Intermediate consumption											
1.2.1. Actual intermediate consumption					X	X	X		X	X	
1.2.2. Internal intermediate consumption	X	X	X			X	X		X	X	
2. Capital formation in specific goods and services						X	X			X	X
3. Fixed capital formation of characteristic activities in non specific products *)	X	X	X	X	X	X	X		X	X	X
4. Specific current transfers (not counterpart of item 1)	X	X	X	X	X	X	X	X	X		X
5. Specific capital transfers (not counterpart of item 2 or 3)				X				X			
Total uses of resident units											
6. Current uses of resident units financed by the rest of the world (less)											
7. Capital uses of resident units financed by the rest of the world (less)											
National expenditure											

*) and their acquisition less disposals of non-produced non-financial assets

TABLE XXI.3 National Expenditure by components and by users/beneficiaries

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COMPONENTS OF USES/NATIONAL EXPENDITURE	TOTAL	Users/Beneficiaries 1 Market producers	2 Non market producers	3 Government as collect. consumer	4 Household as consumers	5 Rest of the world
1. Consumption of specific goods and services						
1.1 Actual final consumption						
1.1.1. Market products					x	
1.1.2. Non market products						
1.1.2.1. Individual					x	
1.1.2.2. Collective				x	x	
1.2. Intermediate consumption						
1.2.1. Actual intermediate consumption		x	x			
1.2.2. Internal intermediate consumption		x	x			
2. Capital formation in specific goods and services		x	x			
3. Fixed capital formation of characteristic activities in non specific products *)		x	x			
4. Specific current transfers (not counterpart of item 1)		x			x	x
5. Specific capital transfers (not counterpart of item 2 or 3)					x	x
Total uses of resident units						
6. Current uses of resident units financed by the rest of the world (less)						
7. Capital uses of resident units financed by the rest of the world (less)						
National expenditure						

*) and their acquisition less disposals of non-produced non-financial assets

TABLE XXI.4 National Expenditure by components and financing units

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COMPONENTS OF USES/NATIONAL EXPENDITURE	TOTAL	1 Market producers	2 NPI's	3 General Government	4 Household as consumers	5 Financial enterprises	6 Rest of the world
	Financing units						
1. Consumption of specific goods and services							
1.1 Actual final consumption							
1.1.1. Market products		X	X	X	X	X	X
1.1.2. Non market products							
1.1.2.1. Individual			X	X	X		X
1.1.2.2. Collective				X	X		
1.2. Intermediate consumption							
1.2.1. Actual intermediate consumption		X	X	X			
1.2.2. Internal intermediate consumption		X	X	X			
2. Capital formation in specific goods and services		X	X	X		X	X
3. Fixed capital formation of characteristic activities in non specific products *)		X	X	X	X	X	X
4. Specific current transfers (not counterpart of item 1)			X	X	X		
5. Specific capital transfers (not counterpart of item 2 or 3)			X	X			
Total uses of resident units							
6. Current uses of resident units financed by the rest of the world (less)							-X
7. Capital uses of resident units financed by the rest of the world (less)							-X
National expenditure							

*) and their acquisition less disposals of non-produced non-financial assets

TABLE XXI.5 SATELLITE INPUT-OUTPUT TABLE (Supply and Use table)

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RESOURCES	TOTAL SUPPLY IN PURCHASERS' PRICES	Trade & transport margins	Taxes on products	Subsidies on products (-)	CHARACTERISTIC PRODUCERS								OTHER PRODUCERS	TOTAL ECONOMY	IMPORTS OF GOODS AND SERV.
					TOTAL	MARKET PRODUCERS			NON MARKET PRODUCERS						
						Principal producers	Secondary producers	Ancillary activities	Principal producers	Secondary producers	Ancillary activities	Others			
GOODS AND SERVICES supply:								Output							
Characteristic products															
1.															
2.															
...															
n.															
Connected products															
1.															
2.															
...															
n.															
Other products															
TOTAL															

USES	TOTAL USES IN PURCHASERS' PRICES		CHARACTERISTIC PRODUCERS								OTHER PRODUCERS	TOTAL ECONOMY	EXPORTS OF GOODS AND SERV.
			TOTAL	MARKET PRODUCERS			NON MARKET PRODUCERS						
				Principal producers	Secondary producers	Ancillary activities	Principal producers Government	Secondary producers	Ancillary activities	Others			
GOODS AND SERVICES uses:						Intermediate consumption							
Characteristic products													
1.													
2.													
...													
n.													
Connected products													
1.													
2.													
...													
n.													
Other products													
TOTAL													

Final consumption expenditure				Gross capital formation		
	NPI's	GOVERNMENT				
HOUSE-HOLDS	individual	collective	individual	Gross fixed capital format.	Changes in inventories	Acquisit. less disposals of valuables

TOTAL GROSS VALUE ADDED/GDP															
Compensation of employees															
Taxes on products															
Other taxes on production															
Subsidies on products (-)															
Other subsidies on production (-)															
Operating surplus, net															
Mixed income, net															
Consumption of fix. capital															
specific products															
non-specific products															
Operating surplus, gross															
Mixed income, gross															
TOTAL															

LABOUR INPUTS															
GROSS FIXED CAPITAL FORM.															
specific products															
non-specific products															
STOCK OF FIXED ASSETS, NET															

Table XXI.6 Basic structure of SEEA

	ECONOMIC ACTIVITIES					ENVIRONMENT
				Economic Assets		
	Production (1)	Rest of World (2)	Final consumption (3)	Produced assets (4)	Non-produced natural assets (5)	Other non-produced natural assets (6)
Opening stock of assets (i)				$KO_{p,ec}$	$KO_{np,ec}$	
Supply (ii)	P	M				
Economic uses (iii)	Ci	X	C	Ig		
Consumption of fixed capital (iv)	CFC			-CFC		
Net Domestic Product (v)	NDP	X-M	C	I		
Use of non-produced natural assets (vi)	Use_{np}				$-Use_{np,ec}$	$-Use_{np,env}$
Other accumulation of non-produced natural assets (vii)					$I_{np,ec}$	$-I_{np,env}$
Environmentally Adjusted Net Domestic Product (viii)	EDP	X-M	C	$A_{p,ec}$	$A_{np,ec}$	$-A_{np,env}$
Holding gains/losses (ix)				$Rev_{p,ec}$	$Rev_{np,ec}$	
Other changes in volume of assets (x)				$Vol_{p,ec}$	$Vol_{np,ec}$	
Closing stock of assets (xi)				$K1_{p,ec}$	$K1_{np,ec}$	

Table XXI.7 Classification of natural assets in SNA and SEEA

	SNA	SEEA
AN.1	**PRODUCED ASSETS**	
AN.11	***Fixed assets***	
AN.1114	Cultivated assets	
AN.12	***Inventories***	
AN.1221	Work in progress on cultivated assets	
AN.2	**NON-PRODUCED ASSETS**	
AN.21	***Tangible non-produced assets***	***Tangible non-produced assets***
AN.211	Land (including associated surface water)	Land including eco-systems
AN.212	Subsoil assets	Subsoil assets
AN.213	Non-cultivated biological resources	Wild biota
AN.214	Water resources	Water
		Air

Table XXI.8 Other accumulation entries of SNA related to use of non-produced natural assets

Code	Description
ENTRIES RELATED TO USE	
K.61	Depletion of natural assets
K.3 part, K.62 part	Quality changes of land due to changes in economic uses (e.g. due to restructuring) (+,-)
K.62 part	Degradation of land (soil, landscape, eco-systems) due to economic uses except discharge of residuals (-)
K.62 part	Degradation of non-produced natural assets due to discharge of residuals (-)
K.62 part	Restoration of the quality of non-produced natural assets (+)
ADDITIONAL ENTRIES RELATED TO ACCUMULATION	
K.3 part, K.62 part	Gross additions (less other reductions) to the level of exploitable subsoil resources (+,-)
K.3 part	Transfers of other natural assets to economic activity (+,-)
K.12.22 part	Changes in classification of natural assets due to economic activities (e.g., change of economic use) (+,-)
ENTRIES NOT RELATED TO ACCUMULATION	
K.5	Natural growth of non-cultivated biological resources
K.7	Catastrophic losses
K.8	Uncompensated seizures
K.9	Other volume changes in non-financial assets nec.
K.12 part	Changes in classifications and structure (excluding K.12.22)

Table XXI.9 Two digit ISIC categories which identify environmental protection services

Code	Category	
37	Recycling	
90	Sewage and refuse disposal, sanitation and similar activities	
	90.1*	Collection, transport, treatment and disposal of waste
	90.2*	Collection and treatment of waste water
	90.3*	Cleaning of exhaust gases
	90.4*	Noise abatement
	90.5*	Other environmental protection services n.e.c.
	90.6*	Sanitation and similar services

* Proposed SEEA breakdown